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BATTLE SIMULATION BOARD GAMES: AN ANALYSIS IN TERMS OF DESIGN CHARACTERISTICS AND LEADER SKILLS

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January 1980

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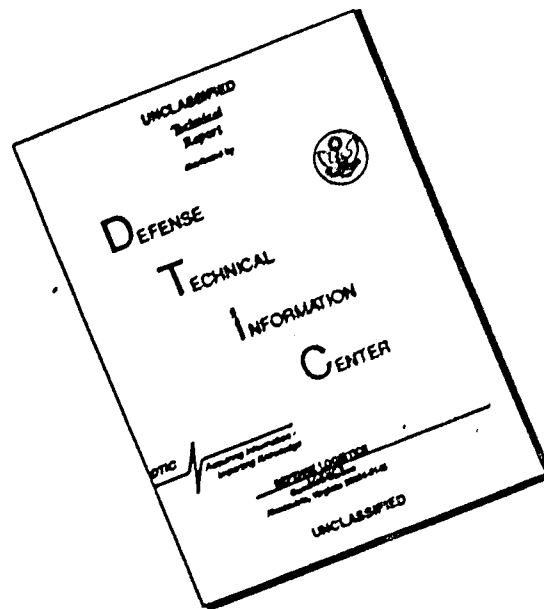for the Department of the Army

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER Research Note, 80-2	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Battle Simulation Board Games: An Analysis in Terms of Design Characteristics and Leader Skills.		5. TYPE OF REPORT & PERIOD COVERED
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Donald R. Jones, Jr., Peter B. Wylie, Kermit F. Henriksen, Edgar L. Shriver and David L. Hannaman		8. CONTRACT OR GRANT NUMBER(s) MDA 903-78-C-2005
9. PERFORMING ORGANIZATION NAME AND ADDRESS Kinton, Inc. 1500 Beauregard Street Alexandria, VA 22311		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 2Q263744A795
11. CONTROLLING OFFICE NAME AND ADDRESS US Army Research Institute for the Behavioral and Social Sciences, 5001 Eisenhower Ave, Alexandria, VA 22333		12. REPORT DATE January 1980
		13. NUMBER OF PAGES 51
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office) ARI / KN-1		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Battle Simulation; Tactical Training; Tactical Training Systems; Leader Training; Leader Skills; Leader-Group Interaction; Board Games

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The objective of this effort was to analyze three small unit battle simulation board games in terms of design characteristics, leader skill practice opportunity, and psychological fidelity.

Three battle simulation board games--Tactical Opposition Exercise (TOX), Small Combat Unit Evaluation (SCUE), and Dunn-Kempf--were rated by the authors with respect to: (a) their administrative and design characteristics, (b) the degree to which they provide leaders with an opportunity for

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20. Abstract (continued)

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practicing leader skill, and (c) the degree to which they provide fidelity, i.e., require players to perform the same action as required in combat or engagement simulation exercises.

Differences were found among the three battle simulation board games with respect to administrative and design characteristics, fidelity, and opportunity to practice leader skills. In general, TOX and SCUE received their highest ratings for training on problem solving and communication skills, whereas Dunn-Kempf received its highest ratings for training on technical skills, such as terrain analysis.

Research Note 80-2

BATTLE SIMULATION BOARD GAMES: AN ANALYSIS IN TERMS
OF DESIGN CHARACTERISTICS AND LEADER SKILLS

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January 1980

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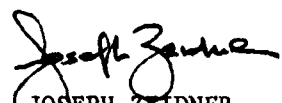
FOREWORD

Research initiated by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) in 1972 has led to the development of a family of tactical engagement simulation training techniques. This report provides an analysis of three battle simulation board games in terms of design characteristics, leader skill practice, and leader skill practice opportunity. The research conducted was in response to the requirements of Army Project 2Q263744A795 as a part of a larger program of research in tactical training for TRADOC.

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BATTLE SIMULATION BOARD GAMES: AN ANALYSIS IN TERMS OF DESIGN
CHARACTERISTICS AND LEADER SKILLS

BRIEF

Requirement:

To analyze three small unit battle simulation board games in terms
of design characteristics, leader skill practice opportunity, and
psychological fidelity.

Procedure:

Three battle simulation board games--Tactical Opposition Exercise
(TOX), Small Combat Unit Evaluation (SCUE), and Dunn-Kempf--were rated
by the authors with respect to: (a) their administrative and design
characteristics, (b) the degree to which they provide leaders with an
opportunity for practicing leader skill, and (c) the degree to which
they provide fidelity, i.e., require players to perform the same action
as required in combat or engagement simulation exercises.

Findings:

Differences were found among the three battle simulation board
games with respect to administrative and design characteristics, fide-
lity, and opportunity to practice leader skills. In general, TOX and
SCUE received their highest ratings for training on problem solving and
communication skills, whereas Dunn-Kempf received its highest ratings
for training on technical skills, such as terrain analysis.

Utilization of Findings:

The procedures or analytical techniques employed in the study may
be utilized in whole or part for the analysis of battle simulation board
games. The analysis of the three games also may be used to isolate the
training strengths and weaknesses of board games possessing different
design characteristics.

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Battle Simulation Board Games:
An Analysis In Terms of Design Characteristics and Leader Skills

The purpose of this part of the overall research effort was to
analyze the characteristics of three battle simulation board games
for training small unit leaders. Specific objectives involved ana-
lyzing the three games with respect to: a) their administrative
and design characteristics, b) the degree to which the games pro-
vide leaders with an opportunity for practicing leader skills
identified earlier (Henriksen, Jones, Hannaman, Wiley, Shriver, Hamill,
and Sulzen, 1980), and c) the degree to which the games provide fidelity
or require players to perform the same actions and make the same deci-
sions as in combat or engagement simulation exercises.

The three games played and analyzed were Tactical Opposition
Exercise (TOX), Small Combat Unit Evaluation (SCUE), and Dunn-Kempf.
Although each game has as its major purpose the training of small unit
leaders for combined arms operations, the background and current uses
to which these games are currently being put are quite different. TOX
is an experimental product of ARI's Engagement Simulation Technical
Area that has been investigating the potential of battle simulation
(BS) as a small unit training tool. SCUE is an experimental product
adapted from the TOX by personnel of ARI's Combat Performance
Standards and Evaluation team for the forecasting of unit effec-
tiveness in engagement simulation exercises. Dunn-Kempf is a product
of the Command and General Staff College at Fort Leavenworth, Kansas
and is currently available to company-size units as a training tool
for company team operations.

The three games have several distinct similarities:

- They focus on company team tactical operations.
- They call for the use of multiple players.
- They incorporate the major weapons systems used in
  combined arms operations.
- They use playing surfaces that require players to
  make map-ground associations.
- They all include the play of indirect fire support.
- Each of the games is two-sided and simulates to some
  extent the free play nature of actual combat.

The three games also differ in major ways:

Physical separation of players. In TOX and SCUE each player has
his own playing surface and is separated physically from his
fellow players as well as opposing players. In Dunn-Kempf
there is one large playing surface on which opposing sides are
separated by an 18 inch cloth screen which partially obstructs
vision between the two sides. Fellow players are not physically
separated and have direct visual and verbal contact with each
other at all times.

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Communication. Because of their physical separation players in TOX and SCUE must communicate by radio. Fellow players in Dunn-Kempf are always in a position to observe each other's movements and to communicate with each other verbally and visually without the use of a radio.

System for indirect fire support. Both TOX and SCUE integrate the use of a Fire Detection Center (FDC) through which all requests for fire support are made via field radio. Although Dunn-Kempf incorporates the play of indirect fire support, it does not involve the use of an FDC. All requests for artillery are made verbally to a controller who directly delivers each mission.

For the reader not familiar with these games, a more detailed description can be found in Appendix A.

Administrative and Design Characteristics of the Game

To develop a framework by which the three games could be analyzed, the research staff generated seven relatively independent categories of game characteristics:

● System effectiveness for preparing players and controllers
● Manageability of control
● Weapons/equipment availability
● Movement and detection realism
● Weapons effects realism
● Engagement realism
● Environmental realism

Each of the seven categories can be subsumed under two broader classes: administrative (i.e., ease of administering the game) and design (i.e., how well the game simulates a combat environment). The administrative class comprises the first two categories: system effectiveness for preparing players and controllers, and manageability of control. The design class is composed of the remaining categories: weapons/equipment availability, movement and detection realism, weapons effects realism, engagement realism, and environmental realism. Within each category there are several characteristics. The characteristics are listed separately in the category tables that follow. For each table the degree to which the respective games take into account the listed characteristics is indicated by "Yes," "No," and "Partially" designations. A "Yes" designation means the characeristic is accounted for in the game. "Partially" indicates that the characteristic is present, but that further development is possible. A designation of "No" means the characteristic is not found in the game. A brief discussion accompanies each table.

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System Effectiveness for Preparing Players and Controllers

The three battle simulation games as indicated in Table 1 show a striking difference with respect to their feasibility as a training tool. The game documentation for Dunn-Kempf includes an instructional video-tape, view-graphs, training script and game guidance booklets. This training package allows officers designated as controllers to acquire a reasonable mastery of game rules within a few hours.

TABLE 1

The Degree To Which The BS Games Provide For Player And Controller Preparation

Characteristics	TOX	Dunn-Kempf	SCUE
● Game documentation is sufficiently precise for junior officers to master game control procedures within three to four hours.	No	Yes	No
● Game documentation provides clear, simple instructions for controller procedures along with many examples and graphic aids that complement the instructions.	No	Partially	No
● Game documentation provides practice items for beginning controllers to test their knowledge of rule applications (e.g., a self-mastery section).	No	Partially	No

Currently both TOX and SCUE do not have an appropriate training package for proper implementation. Both games need manuals that are written in an instructionally sound format. The format should include coverage of the major rules, examples of how these rules are applied to frequently occurring game situations, practice examples for the beginning controller, and feedback to the controller on specific rules applications on which he may need more practice. Since TOX and SCUE require more controller sophistication to assure competent game play the development of sound instructional materials is imperative for adequate controller training. Historically TOX has been introduced to Army units by research personnel and has not stood alone as an independent training tool. SCUE to date has been used exclusively in a research mode.

While preparing and playing Dunn-Kempf the research staff found that the game manual does not provide a complete set of guidelines for some game rules. For example, Dunn-Kempf incorporates the play of anti-tank mines but does not specify the size of the mine field or how many can be employed. Also, Dunn-Kempf provides for other game

options such as adverse weather conditions and night operations but comprehensive rules to execute these options are not available.

Manageability of Control

The research staff encountered various problems with respect to manageability of control for all three games. The most serious of these is the length of time required to play the game. The other characteristics reported in Table 2 tend to contribute to this major problem. In Dunn-Kempf, eight hours of game play are equal to 30 minutes of combat. In TOX and SCUE, four hours of game play are equal to $1\frac{1}{2}$ hours of engagement simulation/combat. Dunn-Kempf game mechanics are time-consuming; an additional controller might speed up the game and facilitate play. When contact between opposing forces involves a large number of weapons systems the individual resolution

TABLE 2

The Degree To Which The BS Games Account For
Manageability Of Control

Characteristics	TOX	Dunn-Kempf	SCUE
● Game documentation provides a number of controller aids (e.g., a miniature detection map) that facilitate controller decisions.	Partially	Partially	Partially
● There is a close correlation between game time and real time so that the interest of game participants doesn't wane.	Partially	No	Partially
● Game design provides for sufficient personnel to perform all control tasks.	Yes	No	Yes

for each engagement takes a considerable amount of time. Revisions in game mechanics or an additional controller to assist in resolving engagement and processing indirect fire requests could easily speed up the game. TOX and SCUE should also be closely examined to determine ways in which the time for game play could be reduced. Possible revisions to certain game mechanics may be one way. Another might be to revise or increase the number of controller aids. For example, in TOX and SCUE, detection decisions could be speeded up if the controller had an aid to plot and update all piece positions.

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Weapons and Equipment Availability

All three games incorporate the major weapons systems currently available to company team units. Perusal of Table 3 shows the three games vary as to their treatment for other types of weapons. SCUE provides for the use of M50 and M2 machine guns, but the rules do not

TABLE 3

**The Degree To Which The BS Games Account For
Weapon/Equipment Availability**

Characteristics	TOX	Dunn-Kempf	SCUE
● Game provides for employment of the following types of mines:			
a. Anti-personnel mines	Yes	No	Partially
b. Anti-tank mines	Yes	Partially	Partially
● Game provides for use of the following direct fire weapons types:			
a. Main gun M60A1, M60A2 battle tank	Yes	Yes	Yes
b. Guided missile anti-tank weapons including TOWs and Dragons	Yes	Yes	Yes
c. Light anti-tank weapons, LAW and viper	Yes	Partially	Yes
d. Machine guns, light and heavy	Yes	Partially	Partially
e. Small arms including M16, M203 and grenades	Yes	Partially	No
● Game provides for the use of the following types of indirect fire:			
a. Artillery 105mm, 155mm	Yes	Yes	Partially
b. Mortars 81mm, 106mm	Yes	Yes	Partially
c. Different fuzes (PD, VT) and smoke for mortar and artillery pieces	Yes	Partially	Partially
● Game provides for play of commonly used equipment such as: land wire communication, pyrotechnics (Red Star clusters, smoke), concertina wire, and tank obstacles.	Partially	Partially	Partially
● Game provides for helicopter gunship support of TAC Air support including appropriate ordnances (e.g., napalm, rocket, CBUs, etc.).	No	Yes	No

provide appropriate casualty effectiveness tables. Also SCUE does not simulate M203s. Dunn-Kempf rules provide for M60 machine gun teams as separate playing pieces, but the rules do not include M60s in the U. S. direct fire table. It appears that all small arms fire in Dunn-Kempf is included under the heading of "Fire Team." The research staff feels that probabilities for obtaining suppression against vehicles and personnel for this amalgamation of weapons is too low. Dunn-Kempf rules call for the use of anti-tank mines but do not specify how many mines or fields are available. Currently SCUE rules do not incorporate the play of anti-tank mines and only address the M18 claymore in the anti-personnel category. Neither the rules for Dunn-Kempf nor SCUE provide for the use of different types of artillery fuzes (e.g., point detonation and variable time). All three games could better address commonly used equipment such as pyrotechnics for visual signaling, concertina wire and tank obstacles.

SCUE and TOX do not incorporate any type of close air support. Play of a moderate level of air support would certainly strengthen TOX. SCUE most likely will incorporate air support when it becomes part of the ES environment.

Movement and Detection Realism

All three battle simulation games provide rules for movement and detection of personnel and vehicles. Examination of these rules revealed a number of gaps in the guidelines for movement and detection. TOX and SCUE do not have rules restricting infantry movement when

TABLE 4

The Degree To Which The BS Games Account For
Movement And Detection Realism

Characteristics	TOX	Dunn-Kempf	SCUE
● Game rules provide precise guidelines for movement allowed in each time frame for personnel and vehicles. Rules for movement should take into consideration suppression of personnel and vehicles, type of terrain, weather, and if vehicles are buttoned or unbuttoned.	Partially	Partially	Partially
● Game rules provide precise guidelines for detection of troop and vehicular movement under varying circumstances (e.g., troops crawling, vehicles driving at night, wooded open or hilly terrain).	Partially	Partially	Partially

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infantry movement when ground units are receiving suppressing direct fire. While TOX provides some suppression rules for infantry receiving indirect fire, SCUE does not. Dunn-Kempf suppresses all vehicles hit, but not killed, for only one game turn. Consequently, a vehicle hit one turn may move at full speed after the next turn. Movement rules should reflect restricted movement for vehicles that have been damaged by direct or indirect fire. Also, TOX and SCUE do not provide guidelines for the movement of vehicles in the buttoned or unbuttoned condition. That is, when vehicles receive direct or indirect fire they must close hatches and use vision blocks to guide subsequent movement. Use of these vision blocks reduces a driver's visibility and vehicle speed is reduced to compensate for this limited vision.

In TOX and SCUE, detection distances seem liberal enough though speed of movement and numbers of personnel and vehicles are considered. Variables such as vehicle formation and use of the folds of the terrain are not explicitly referred to in the games' detection rules. Their incorporation into the game would provide for more realistic detection criteria. Detection in Dunn-Kempf is determined totally by line of sight. Given the size of the game board, it is difficult to obtain a sighting at all points of the playing surface. Also, Dunn-Kempf does not call for the giving of auditory and visual cues such as noise of tank engines or dust columns from large numbers of armored vehicles.

None of the games differentiate between detection and target acquisition. If a weapons system acquires detection it automatically has target acquisition. This is not good simulation. For example, a puff of smoke at 2,000 meters may constitute detection but not necessarily target acquisition. The smoke could be a signature from a tank or a TOW system. But it might not be possible for an opponent to obtain a good target sighting without being 500 to 1,000 meters closer to the target. It is quite possible for a signature to be detected as the smoke rises above a tree line or after it has drifted from the firing system. Target suppression (fire placed into the probable location of the weapons system) is a more probable outcome of signature detection before target acquisition.

All of the games need more specific rules for game play during periods of reduced visibility such as night operations or during adverse weather conditions. The Dunn-Kempf game manual does not address tactical operations during periods of limited visibility. However, such operations are referred to in the British Wargame booklet which accompanies the Dunn-Kempf game.

Weapons Effects Realism

There is also a disparity in the games with respect to realism of weapons effects. Table 5 indicates that the games could account for a better simulation of weapons effects.

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TABLE 5

The Degree To Which The BS Games Account For
Weapons Effects Realism

Characteristics	TOX	Dunn-Kempf	SCUE
● Game rules provide precise guidelines for determining hits on vehicles, personne', and bunker complexes and subsequent suppression of these targets.	Partially	Partially	Partially
● Game rules provide a means for accurately determining weapons effectiveness against specific types of targets (e g., bunkers, tanks moving, tanks stationary, troops crawling, troops in the open, troops using natural cover, and short spurts of movement, etc.).	Partially	Partially	Partially
● Game provides method for determining weapons effectiveness as a function of range to target and number of rounds being fired.	Yes	Partially	Yes
● Game provides a realistic system for determining the effectiveness of anti-personnel mines as a function of their effective range and their density.	Partially	No	No
● Game provides specific system for determining the effectiveness of anti-tank mines as a function of the known effects of the mines and their density. (For example, heavy anti-tank mines are capable of destroying a tank as opposed to partially disabling it.)	Yes	No	Partially
● Game provides a realistic system for determining the effectiveness of indirect fire by fuze type and quantity of rounds delivered.	Yes	No	No
● Game provides for accurate simulation of impact of different types of artillery fire.	Yes	Yes	Partially
● Game provides for accurate simulation of impact of tactical air support ordnance.	No	Partially	No
● Game provides for indirect fire effectiveness as a function of target type.	Yes	Yes	Yes

All three games fail to address adequately the effects of weapons against dismounted infantry utilizing various types of cover. Dunn-Kempf considers weapon type and range to determine a hit or kill on a fire team. No provision is made for infantry occupied positions in wooded terrain or in built-up areas. TOX and SCUE reduce weapons effects against troops in prepared positions but do not consider infantry utilizing natural cover.

All three games have direct fire tables to determine weapon effectiveness against specific types of targets. The TOX and SCUE tables are based on range, type of target, whether the target is moving or stationary, and the number of rounds fired. The Dunn-Kempf table is based on range, type of target, and movement. The fact that it omits number of rounds fired makes the hit probabilities seem unrealistic and conservative.

Dunn-Kempf does not include use of anti-personnel mines in game play. SCUE only accounts for play of claymore mines. The TOX rules appear to be too conservative for the assessment of casualties from anti-personel mines. SCUE, based on the current ES environment, rarely plays anti-tank mines. Dunn-Kempf calls for the play of anti-tank mines but the rules make no provision for differential effective-ness as a function of number of mines employed, or number of vehicles entering the mine field.

Also, as indicated by Table 5, Dunn-Kempf and SCUE do not call for the play of different types of indirect fire fuzes and multiples of battery or section fire.

TOX and SCUE do not involve the play of TAC air support. Al-though Dunn-Kempf includes TAC air support, it appears that delivery of the ordnance is considerably less accurate than that used in actual combat. Before fighter aircraft drop their ordnance, the target is carefully marked with smoke by a forward air controller after coordination with the ground unit. Once the target is properly marked, fighter aircraft are extremely accurate in delivering their ordnance.

Engagement Realism

Table 6 reflects a number of characteristics of engagement realism either partially accounted for or not addressed at all. Also, even though the characteristic concerning the rule applicable to extended engagements shows a "yes" statement, the research staff had some difficulty resolving the completeness of this rule. An initial engagement may occur when vehicles and troops for one force are in a vulnerable posture. Subsequent survivors who may continue the engage-ment will be fighting from some type of cover and the return fire may not be as accurate. This holds true for both sides of the engagement. That is, direct fire contact between two forces is often not effective

TABLE 6

The Degree To Which The BS Games Provide For
Engagement Realism

Characteristics	TOX	Dunn-Kempf	SCUE
• Game rules provide specific guidelines for extended engagement after initial fire and return fire.	Yes	Yes	Yes
• Game rules provide controller procedures for arbitrating simultaneous engagement.	Yes	No	Yes
• Game rules provide precise guidelines for arbitration of major contact between large numbers of personnel and vehicles.	Yes	Partially	Yes
• Game rules provide guidelines for suppression of troops and vehicles by specific direct fire weapon type and intensity f engagement.	No	Partially	No
• Game rules provide specific guidelines for impairing unit's indirect fire capabilities as a consequence of communication loss. (Note: includes loss of leader personnel.)	No	Yes	No
• Game rules provide specific guidelines for assessing hits and casualties for massing of weapons on one target (e.g., machine guns, rifle arms, LAWs, etc. against a fortified position or APC).	Yes	No	Yes
• Game rules provide variable hit probabilities for anti-tank weapons as a function of movement in different types of terrain.	No	No	No
• Game provides guidelines for suppression of troops and vehicles by type and intensity of indirect fire.	Partially	Partially	Partially

because of the return fire each side is receiving. Casualty assessment for this type of situation is very difficult.

None of the games very adequately account for suppression of targets after assessment of initial casualties in direct fire engagements. Dunn-Kempf rules suppress targets which are hit but not killed for one game. One game turn does not seem very realistic for suppressing a target that is receiving effective fire. Detailed suppression tables need to be developed for TOX and SCUE. For example, neither game restricts troop movement for units receiving effective fire.

Game rules for Dunn-Kempf treat several weapons systems firing against one target on an individual basis. TOX and SCUE, using probability tables, increase the probability for a hit if more than one weapons system is firing at an identical target. None of the games consider suppression of a target by direct fire where the beaten zone of such fire lands in close proximity of a target which is unseen by the firer. Also, none of the games take into account the type of terrain during anti-tank guided missile engagement. For example, if a tank is moving in rolling or hilly terrain it is quite possible that a TOW fired from 2,000 meters away would not hit the target before it was masked by a hill.

TOX and SCUE only incorporate communication loss when a subordinate leader's unit is totally neutralized. Temporary communication loss by other means such as radio failure or electronic jamming is not played. While Dunn-Kempf provides for communication loss through suppression or loss of command vehicles, and through electronic jamming, it considers these situations as optional game dimensions.

Environmental Realism

A number of differences were found among the research games, TOX and SCUE, and Dunn-Kempf with respect to their treatment of environmental realism. Table 7 shows the degree the games accounted for each characteristic in the environmental realism category.

Dunn-Kempf does not require physical separation of players on the same team. However, physical separation is commonplace in a combined arms operation. Radio communication is also the primary means with which these separated leaders communicate. As Dunn-Kempf does not require some separation of the team commander and his subordinates, the communications among these players tend to be more informal and conversational. It bears little resemblance to the radio communications required between unit or element leaders in a combat or ES environment.

Another difference is found in the free play characteristic. The curtain provided in Dunn-Kempf to screen movement of opposing

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TABLE 7

The Degree To Which The BS Games Incorporate
Environmental Realism

Characteristics	TOX	Dunn-Kempf	SCUE
● Game play is initiated by issue of an operations order that requires company leaders and subordinate leaders to develop sufficiently detailed plans to meet operational requirements similar to those in an actual combat environment	Yes	Yes	Yes
● Game play requires multi-person participation.	Yes	Yes	Yes
● Game play requires physical separation of players for all occasions in which players would be separated on the ground.	Yes	No	Yes
● Game play simulates standard field methods of communication between units including radio.	Yes	No	Yes
● Game play requires free play, two-sided opposition conditions, where opposing forces develop the battle situation in response to actions taken by the other side.	Yes	Partially	Partially
● Game rules provide realistic guidelines for the development of defensive positions (in a 24 hour period) in terms of anti-tank obstacles, mines, and number of fortified positions.	Yes	No	Partially
● Game rules provide specific guidelines for determining the line of sight in different types of terrain.	Partially	Partially	Partially
● Game rules provide guidelines for giving visual signals.	Partially	Partially	Partially
● Game play requires leaders to execute tactical operations using map-to-ground techniques.	Yes	Yes	Yes
● Game provides for simulation of battlefield system for employing indirect fire including use of an FO, and FDC, registration points, and subsequent adjustments, and allocation of munitions.	Yes	No	Yes
● Game provides for accurate simulation of procedures for requesting close air support from helicopters and fighter aircraft	No	Partially	No
● Game provides for play of electronic jamming.	No	Yes	No

forces before the making of visual contact is only partially
effective. As game play proceeds, the curtain becomes less and
less effective. Eventually, it is almost impossible for players to
avoid seeing all enemy positions. This clear view of enemy positions
provides players with little relevant practice in estimating the
location of the enemy and his intentions.

It is also interesting to note the different ways the games
treat the line of sight characteristic. The line of sight
technique employed in the Dunn-Kempf game requires players to
visually inspect piece positions on a 3D surface. The procedure is
moderately successful when pieces are located at the edge of the board
game. However, at other areas of the board, especially the center,
line of sight cannot be accurately determined.

SCUE, using a photo map of terrain found at home station,
familiarizes controllers and players with the terrain in order to
achieve the ability to determine line of sight. This may be the
best technique. However, the photo map and accompanying hex sheets
do not lend themselves to easy line of sight determination. The
TOX 2D multicolor surface and the 3D surface are designed to aid
the controller in determining line of sight. While these techniques
have been moderately successful, their proper use is still dependent
upon good map readers. Further refinements in the techniques are
still needed so line of sight can be more easily determined.

The use of artillery in Dunn-Kempf was also found to be a less
than valid simulation. There were deemed to be three major reasons
for this situation:

● Dunn-Kempf requires no FDC-FO interaction. Requests for fire
missions are passed informally from leaders, or other
players designated as FOs, directly to the game controller.

● Once a fire support plan has been handed to the controller
at the beginning of the game, it cannot be changed during
the exercise regardless of game developments that might make
the initial fire support plan ineffective.

● Allocation of artillery rounds in Dunn-Kempf is handled by
a roll of the die rather than by situational necessity. For
example, in an actual battle situation, a request for fire
on a suspected target might well be denied if a battery has
a limited allocation of rounds. However, a unit in heavy
contact might well have the exact same mission approved if
it were apparent that the mission could be vital to that
unit's survival.

Analysis of Game Ratings

There are two main objectives to this next section: (a) to assess the degree to which the games provided leaders with an opportunity for practicing the earlier identified leader skills and (b) to assess the degree to which the games provide fidelity (i.e., require players to make the same decisions and perform the same actions as in combat or engagement simulation exercises. To achieve these objectives, a game rating procedure based upon the Delphi technique was developed (Dalkey and Helmer, 1963).

With the exception of SCUE, each game was played twice by the research staff. The purpose of the first game play was to become familiar with the rules. The second game play was conducted for the purpose of evaluation. Because of the similarity in the rules and game mechanics to TOX, it was not necessary to play a familiarization game for SCUE. After the second game play, the research staff rated each game twice according to the Delphi technique (Dalkey and Helmer, 1963). The instrument used was a battle simulation board game rating scale (Appendix B) developed earlier in the project. The rating scale was derived from and based upon the leader skills and group interactive processes identified in the first report of the series. After the rating scales were filled out, staff members collectively discussed the rationale of their ratings. In this fashion, staff members were able to identify areas of agreement and disagreement. Where there were initial discrepancies between raters on particular items (a difference of three or more units on an 0-8 point scale), a discussion ensued in order to arrive at a common framework of understanding. The game was then rerated.

Two dimensions of battle simulation games, which parallel our stated objectives, were assessed by the rating scale: a) the degree to which the game provides an opportunity for exercising identified leader skills (relative to each other) that are found in combat and engagement simulation (ES) situations, and b) the degree to which the game provides fidelity or requires players to perform the same actions and make the same decisions as in combat or ES exercises. Ratings were made on a 0-8 point scale by a two-step process. One of the three broad categories (LOW - MODERATE - HIGH) was first assigned to the skill in question for either the opportunity or fidelity dimension. A finer discrimination was then made within each broad category. In the MODERATE category, for example, three sub-levels were to be discerned--less than moderate, moderate, or more than moderate. An important point to keep in mind, however, is that the individual skills were rated in terms of whether there was an opportunity for them to occur and not on whether they actually did occur. If ratings were based on the latter, expertise of players would have been rated rather than the skills that the games have the potential to promote. Appendix C provides a complete set of the instructions used by raters.

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Before commenting in detail on the ratings in Tables 8 and 9, a brief explanation of the table format is in order. Along the left-hand margin are listed 12 skill categories. The first set of four covers management skills, the second set covers communication skills, the third set problem solving skills, the next set tactical skills, and the last set technical skills. The individual skills that compose each skill category are listed on the battle simulation board game rating scale (Appendix B).

The final rating that the reader finds reported in Table 8 refers to the second (and final) set of ratings. They are based on the ratings given the individual skills in a given category by the four raters who played each game. Table 8 is probably the easiest to use for getting an overall glimpse of the data. Table 8A (reported in Appendix D) provides the first mean ratings and second mean ratings as well as the absolute difference between the two. Table 9 is analogous to Table 8, but instead reports mean ranges. These values thus represent convenient measures of dispersion or agreement among raters averaged across all the individuals in that particular category. Table 9A (reported in Appendix D) gives the mean ranges for the first and second ratings, as well as the absolute difference between the two ratings. One effect, quite apparent and consistent in Table 9A, is the smaller ranges in the rerating column compared to the first rating column. In brief, there was considerably less disperson in the second rating. We thus believe the Delphi technique was a viable method for reaching common accord among raters.

TABLE 8

FINAL MEAN RATINGS BY SKILL CATEGORY

SKILL CATEGORY		OPPORTUNITY			FIDELITY		
		TOX	DUNN-KEMPF	SCUE	TOX	DUNN-KEMPF	SCUE
Management	Planning	5.4	5.2	5.4	4.8	3.9	4.3
Management	Execution & Control	6.4	5.1	6.6	5.3	1.8	4.9
Management	Initiating Structure	4.4	4.0	4.9	3.5	2.4	3.6
Management	Interaction with Sub-ordinates/Supervisors	4.1	4.6	4.5	3.6	2.7	3.4
Communication	Transfer of Information	6.1	4.1	5.8	5.3	2.1	4.8
Communication	Pursuit & Receipt of Information	5.8	5.5	5.7	4.7	2.9	4.0
Problem Solving	Identifying & Inter-preting Cues	7.0	5.7	6.4	6.0	2.8	4.5
Problem Solving	Weighing Alternatives	7.0	4.3	7.0	6.3	1.9	5.4
Problem Solving	Chooses & Executes Course of Action	7.0	5.3	6.4	6.3	2.4	4.6
Tactical	Application	5.8	4.6	5.5	4.1	2.7	3.9
Technical	Equipment	3.8	2.4	3.2	2.9	1.6	2.3
Technical	Basic	7.0	7.0	6.3	5.4	5.5	4.3

TABLE 9

FINAL MEAN RANGES BY SKILL CATEGORY

SKILL CATEGORY		OPPORTUNITY			FIDELITY		
		TOX	DUNN-KEMPF	SCUE	TOX	DUNN-KEMPF	SCUE
Management	Planning	.9	1.8	1.5	1.2	1.7	1.4
	Execution & Control	.8	3.2	.6	1.8	2.0	1.2
	Initiating Structure	1.0	1.8	1.4	1.3	1.7	1.3
	Interaction with Sub-ordinates/Supervisors						
Communication	Transfer of Information	.5	1.8	1.3	1.3	1.3	1.4
	Pursuit & Receipt of Information	1.0	1.7	1.5	1.6	1.6	1.6
Problem Solving	Identifying & Inter-preting Cues	.0	1.5	2.0	2.0	1.0	2.0
	Weighing Alternatives	.0	1.0	.0	1.0	.5	1.0
	Chooses & Executes Course of Action	.0	1.8	1.5	1.0	2.8	1.3
Tact-ical	Application	1.3	1.0	1.0	1.0	1.4	1.5
Tech-nical	Equipment	.8	.7	1.4	1.1	1.0	1.7
	Basic	.0	.7	1.3	.9	1.4	1.6

Table 10 reports interrater reliability coefficients for initiating structure from the opportunity dimensions of Dunn-Kempf. The initiating structure category from the opportunity dimension of Dunn-Kempf was selected at random and interrater reliability coefficients were calculated as a further check on whether common accord was being reached by raters. Most noteworthy are the higher correlation coefficients among the raters for the rerating. Once again, we feel that the intervening discussion allowed by the Delphi technique helped to raise the correlations to an acceptable level on the rerate.

TABLE 10

INTERRATER RELIABILITY COEFFICIENTS*
FOR INITIATING STRUCTURE FROM THE
OPPORTUNITY DIMENSION OF DUNN-KEMPF

	FIRST RATING					RERATING			
	A	B	C	D		A	B	C	D
A		.33	.60	.76	A		.79	.90	.90
B			.54	.70	B			.83	.84
C				.62	C				.94

*Coefficients are Pearson product-moment correlations

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Presented on the following pages is a discussion of the ratings for the individual board games with respect to the degree to which they provided training on the identified leader skills. For this purpose, relevant sections from Table 8 have been extracted.

Planning	Opportunity			Fidelity		
	TOX	D-K	SCUE	TOX	D-K	SCUE
	5.4	5.2	5.4	4.8	3.9	4.3

Planning, for the most part, is performed before the engagement begins. Consequently, there should be almost no difference in the rating of this skill in terms of opportunity for the three games being evaluated. The principal input for the plan provided by the game is a statement of what is known of enemy dispositions and a statement of the mission relayed to the players from higher command. The extent to which pre-game planning occurs thus should not be affected by characteristics of individual games. The opportunity ratings from the above excerpts of Table 8 of 5.4, 5.2, and 5.4 for TOX, Dunn-Kempf, and SCUE are in accord with this expectation.

The characteristics and rules of individual games can affect their fidelity, however. For example, the types of plans that a leader makes in the board games are going to be influenced by the aggregation level of the board pieces. The more aggregated the playing pieces--squads being the smallest movable unit rather than fire teams or individuals--the less specific the plan can be. This constrains a leader who wants to make plans as specific as he would in combat or ES. The larger aggregate level of Dunn-Kempf pieces probably accounts for its lower fidelity rating (3.9), compared with the fidelity ratings for TOX (4.8) and SCUE (4.3). All three mean ratings are in the moderate range, indicating some constraint on planning for the other two games as well.

Execution and
Control

Opportunity			Fidelity		
TOX	D-K	SCUE	TOX	D-K	SCUE
6.4	5.1	6.6	5.3	1.8	4.9

Execution and control refers to the extent to which leaders are able to implement and carry out field operations to their successful conclusion. It is a highly complex skill which depends in varying degrees upon an intricate meshing of related skills (i.e., organizing ability, timely and decisive actions, communication, technical competence). As the above excerpt from Table 8 shows, opportunity to practice this skill received high ratings on both TOX and SCUE and moderate ratings on Dunn-Kempf.

The opportunity for execution and control is essentially a function of how independently the leader and subordinates must operate in the game. If they are physically separated in different rooms, seeing only what their sub-unit can see and hearing from other leaders over a communication net about what they see and are doing, then there is an opportunity for practicing execution and control. However, if the leaders and subordinates are in the same room, observing the same events, seeing the actions and getting the same information about the enemy and outcomes, the opportunity for execution and control is not as great.

Any game that does not require leaders to perform the same actions or to make the same decisions as occur in combat or ES lacks fidelity. Dunn-Kempf had a low rating of 1.8 on fidelity. Any game can have its terrain board duplicated and placed in separate rooms. The only consideration here is cost. A small, two-dimensional terrain board obviously is less costly to duplicate and provide for each player compared to a three dimensional board like Dunn-Kempf. The Dunn-Kempf game was played according to the way it came from the box and its low rating is primarily a function of not having participants in separate rooms.

Initiating Structure	Opportunity			Fidelity		
	TOX	D-K	SCUE	TOX	D-K	SCUE
	4.4	4.0	4.9	3.5	2.4	3.6

The opportunity for initiating structure (defined as the degree to which leaders structure their roles and those of their subordinates toward goal attainment) was considered moderate for all three games. The difference between the opportunity mean ratings of 4.4, 4.0 and 4.9 for TOX, Dunn-Kempf and SCUE are small enough to be considered negligible. A moderate opportunity for initiating structure occurs during the planning stage and after movement on the board begins. Leaders need to break down their operations into achievable steps and to remind their subordinates of their individual responsibilities. One likely reason the ratings are not higher than the moderate range stems from the level of aggregation of the playing units. The more aggregated the playing pieces (i.e., squad rather than fire team or individual), the less opportunity there is for initiating structure. This is a constraint on a leader who may wish to initiate more structure and specify further functions to smaller subdivisions than what the game pieces allow. The mean fidelity ratings of 3.5, 2.4, and 3.6 for TOX, Dunn-Kempf and SCUE also reflect these factors.

Interaction with Subordinates/ Supervisors	Opportunity			Fidelity		
	TOX	D-K	SCUE	TOX	D-K	SCUE
	4.1	4.6	4.5	3.6	2.7	3.4

This leader skill refers to the degree to which an individual's interactions with subordinates and supervisors promotes mutual trust, respect, high morale, group cohesiveness, and ultimately, progress toward goal attainment. TOX, Dunn-Kempf and SCUE, with opportunity ratings of 4.1, 4.5, and 4.5, appear very similar with respect to this skill. Although the opportunity for interaction is essentially the same, experience with the games suggests the types of interactions are different. With Dunn-Kempf, participants are

standing in the same room looking at the same events and thus there is opportunity for interaction. However, since everyone knows the movements of everyone else on their side of the board, task-oriented interactions tend to be supplanted by "casual-social" interactions. In the other two games, leaders are separated and can only interact (except for the initial planning stage) over the communication net. Interactions over the communication net occur just as frequently as face to face, and when they do occur, they are highly task-oriented.

In terms of fidelity, the ratings for TOX, Dunn-Kempf and SCUE are somewhat lower (3.6, 2.7, and 3.4). It is best to remember that skills in this category deal largely with interpersonal and human relations. Since below the platoon leader level, the players are plastic or metal rather than human, the extent to which one can "tactfully and firmly provide corrective feedback to subordinate" is quite limited.

Transfer of Information	Opportunity			Fidelity		
	TOX	D-K	SCUE	TOX	D-K	SCUE
	6.1	4.1	5.8	5.3	2.1	4.8

As a result of the constantly changing cues and events in a tactical operation, transfer of accurate and timely information is a very important communication skill that the games should address. With respect to opportunity, TOX with a mean rating of 6.1 and SCUE with a mean rating of 5.8, are rated practically the same. Dunn-Kempf, on the other hand, was rated substantially lower at 4.1. The same points may be made about this skill as were made about the previous one. While the opportunity for information transfer is present in Dunn-Kempf as reflected in the moderate rating, there is much information that would be superfluous to transfer since the information on the board is displayed equally to all. This is not the case with TOX and SCUE. Since Dunn-Kempf does not require leaders to make the same kinds of actions or decisions in terms of information transfer, we also find it rated low on fidelity (2.1) when compared to TOX (5.3) and SCUE (4.8).

Pursuit and Receipt of Information	Opportunity			Fidelity		
	TOX	D·K	SCUE	TOX	D-K	SCUE
	5.8	5.5	5.7	4.7	2.9	4.0

This skill is concerned with the actions taken by leaders to seek out and to remain open to pertinent information as it concerns the mission (i.e., probes for more detail, sends out lead element, encourages suggestions, establishes means of communication). TOX, Dunn-Kempf and SCUE were rated relatively the same (5.8, 5.5, and 5.7) in terms of opportunity. For reasons stated previously, we were actually surprised to find Dunn-Kempf rated as high as it was. The raters at the time of rating felt there was good opportunity for these skills to occur in Dunn-Kempf even if they were not exercised that frequently in the game. The need to seek out pertinent information was less critical in Dunn-Kempf because the information was available to all on the single playing surface. Thus, we find that Dunn-Kempf has the lowest fidelity rating (2.9) of the three games. TOX was 4.7 and SCUE was 4.0.

Identifying and Interpreting Cues	Opportunity			Fidelity		
	TOX	D·K	SCUE	TOX	D-K	SCUE
	7.0	5.7	6.4	6.0	2.8	4.5

There were only two individual skills listed under this category: (1) recognizes cues as indicator of enemy actions, intentions, or presence, and (2) forms tentative hypotheses as to enemy's disposition given current and previous cues. We find that the opportunity ratings were 7.0, 5.7, and 6.4 for TOX, Dunn-Kempf, and SCUE, respectively. Once again, Dunn-Kempf is rated somewhat lower, whereas TOX and SCUE were considered to provide a high (and essentially the same) degree of opportunity in the exercise of these skills. Our interpretation of this difference centers on two factors: (1) because of the greater visibility of events to players in the Dunn-Kempf game, players are less dependent on subtle cues, and (2) the game rules for Dunn-Kempf do not provide for detection of cues (e.g., detection of engine noise when within close range). Detection of the enemy in Dunn-Kempf was based only on line of sight. Such a restriction surely affects the fidelity of the game. When the fidelity ratings are examined, we find that Dunn-Kempf has the lowest mean rating at 2.8.

Weighing
Alternatives

Opportunity			Fidelity		
TOX	D-K	SCUE	TOX	D-K	SCUE
7.0	4.3	7.0	6.3	1.9	5.4

Weighing alternatives, or assessing the consequences of one's actions, is highly dependent on the previous skill, identifying and interpreting cues. One's alternatives are going to be quite limited if there are few cues to identify. Because of this dependency, it should not be surprising to find that the opportunity and fidelity ratings are similar to the previous skill.

Chooses and
Executes Course
of Action

Opportunity			Fidelity		
TOX	D-K	SCUE	TOX	D-K	SCUE
7.0	5.3	6.4	6.3	2.4	4.6

Choosing and executing a course of action generally follows weighing alternatives, and identification and interpretation of cues in the problem solving sequence. The flow of events is not as orderly nor as unidirectional as the above sequence suggests, however. After weighing alternatives, for example, a course of action may be decided upon to obtain more cues. In brief, the separate stages of the problem solving process are highly inter-related and cyclical. Differences in ratings among the three games are likely to show up on all stages of the problem solving process. Thus, we find the same pattern in the ratings: the opportunity dimension for TOX, Dunn-Kempf and SCUE had ratings of 7.0, 5.3, and 6.4, while the fidelity dimension had ratings of 6.3, 2.4, and 4.6.

The overall trend was for TOX and SCUE to draw upon the practice of problem solving skills to a high degree and with very good fidelity. In fact, of all the skill categories, TOX and SCUE received the highest ratings in the problem solving set. Dunn-Kempf had ratings in the moderate range.

Tactical Application	Opportunity			Fidelity		
	TOX	D-K	SCUE	TOX	D-K	SCUE
	5.8	4.6	5.5	4.1	2.7	3.9

Application of tactical skills refers to the employment of a strategy for accomplishing a specific unit mission. TOX and SCUE received relatively similar ratings whereas Dunn-Kempf had the lowest ratings for both opportunity and fidelity.

The less than adequate simulation of some weapons and weapons systems in Dunn-Kempf most likely is reflected in its low ratings. The number of steps a controller has to take in Dunn-Kempf to arbitrate an engagement during each game turn is quite high and subsequently diminishes the fidelity of the simulation. To employ artillery, one has to roll the dice for approval, roll them again for impact if approval is granted, and roll them once again for effect. The length of an engagement is thus considerably longer than would be the case in ES or combat and as a consequence interest wanes. With the game rules so dependent upon probable events, it is easy for players to perceive the game as a game of chance. Also, it was observed that the employment of artillery and mines in Dunn-Kempf has very little effect. As a result, player motivation for trying to tactically outsmart the enemy seems to decline.

In fairness to Dunn-Kempf, it should be noted that the other games also depend on dice rolls to determine probable events. The ratings for TOX and SCUE were higher, but not considerably so. The difference appears to be the degree to which the games depend upon events over which players have no control. The greater dice throwing characteristic of Dunn-Kempf and its unfavorable rules for artillery employment are two factors which tend to lessen full participation in tactical events.

Technical:
Equipment

	Opportunity			Fidelity		
	TOX	D-K	SCUE	TOX	D-K	SCUE
	3.8	2.4	3.2	2.9	1.6	2.3

None of the games fared very well with respect to equipment skills--and for good reason, too. There is not much opportunity nor fidelity for the exercise of equipment skills with the board games. There are no realistic vehicles upon which "operational checks prior to mission" can be performed nor is there any need to "inform personnel of radio frequencies." Thus, TOX, Dunn-Kempf, and SCUE had respective ratings of 3.8, 2.4, and 3.2. The slightly lower rating for Dunn-Kempf most likely reflects the fact that there was no communication equipment at all used in this game since everybody was playing on the same surface. In TOX and SCUE, communication equipment was slightly better simulated by the use of intercoms placed in separate rooms.

Technical: Basic

	Opportunity			Fidelity		
	TOX	D-K	SCUE	TOX	D-K	SCUE
	7.0	7.0	6.3	5.4	5.5	4.3

Basic technical skills include terrain analysis (e.g., accurately identifies possible enemy avenues of advance) and map reading (e.g., occupies correct positions as identified on map). All three games were quite conducive to the practice of these basic technical skills. Opportunity ratings for TOX, Dunn-Kempf and SCUE were 7.0, 7.0, and 6.3, respectively. The use of maps and the practice of making terrain-map associations were in evidence throughout all three games. In terms of fidelity, the games were rated in the moderate or more than moderate range. TOX was 5.4, Dunn-Kempf 5.5, and SCUE 4.3. The slightly lower rating for SCUE may have resulted from the hex system which tended to make reading topographical detail more difficult.

Summary. As might be expected, the games are not identical with
respect to the opportunity to practice certain skills nor in terms
of fidelity to ES/combat conditions. It was shown that TOX and SCUE
received high ratings on the opportunity dimension for the leader
skill categories of problem solving, communication, planning, and
execution and control, whereas Dunn-Kempf received moderate ratings
for these same categories. With respect to fidelity, TOX received
ratings in the high range for problem solving and moderate ratings
for the other three categories. SCUE received moderate ratings and
Dunn-Kempf received generally low ratings for these same categories.
An important factor that may help explain some of these differences
between Dunn-Kempf and the experimental games of TOX and SCUE was
that in the former all the players were placed around the same game
board whereas in the latter two games players were physically
separated and had individual boards. It was suggested that physical
separation placed greater responsibility and demands on players for
the execution of certain skills (e.g., problem solving and com-
munication) than was the case where players are collectively posi-
tioned at the same board. All of the games received relatively low
ratings on the opportunity and fidelity dimensions for technical
equipment skills. For example, there is simply not much opportunity
nor fidelity for checking to "ensure vehicles are properly camou-
flaged" in the board games. Greater opportunity existed, however,
for the practice of certain basic technical skills (e.g., uses
terrain to conceal routes of advance). Dunn-Kempf, especially re-
ceived high opportunity and fidelity ratings for basic technical
skills.

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REFERENCES

Dalkey, N., and Helmer, O. An experimental application of the Delphi method to the use of experts. Management Science, 1963, 9, 458-467.

Henriksen, K. F., Jones, D. R., Hannaman, D. L., Wylie, P. B., Shriver, E. L., Hamill, B. W., and Sulzen, R. H. Identification of combat unit leader skills and leader-group interaction processes. ARI Technical Report 440, January 1980.

GAME DESCRIPTIONS

Dunn-Kempf

This battle simulation game focuses on the company team, mechanized infantry and armor, in a defensive posture against an OPFOR battalion. The game is played on a three-dimensional terrain board which represents a northern district of West Germany and encompasses an area six kilometers in depth and five kilometers in width. The purpose of Dunn-Kempf is to provide company leaders with training in the following areas: 1) small unit tactics, 2) maneuver tactics, 3) weapons systems capability and lethality, 4) the proper employment of these weapons systems, 5) proper utilization of terrain, and 6) use of supporting fires to include smoke and suppression.

As shown in Figure 1, players composing the company team are situated on one side of the game board. This group includes the team commander, platoon or section leaders and a forward observer. Other players are situated on the other side of the game board and assume various leadership roles within an OPFOR battalion.

A screen, separating the two sides, is placed across the game board. The screen is to prevent players from obtaining a total view of the battlefield. Players are seated at the terrain board and are positioned so they can move pieces which represent their command. Game pieces are miniature models of U.S. and OPFOR tanks, personnel carriers, infantry squads, anti-tank missile systems, anti-aircraft systems, attack helicopters and support vehicles. Game play of Dunn-Kempf is accomplished by players moving and engaging their symbolized elements and weapons systems as they attempt to execute their assigned mission. Usually U.S. forces will employ a defense in depth or conduct a delay under pressure. OPFOR forces primarily conduct a major assault utilizing Warsaw Pact tactics. Each game turn sequentially consists of an indirect fire request or placement, direct fire engagement, and piece movement. A controller receives indirect fire requests from the players and impacts these missions on the board. A player informs the controller when an element or weapons system will engage. The controller verifies line of sight and then determines if the target is in range. If it is, the player will roll a pair of dice. The controller compares the resulting die numbers to those in a probability table to determine if a hit occurred. Players move their own pieces during the movement phase. The controller monitors this movement to assure all moves are according to game rules.

Dunn-Kempf requires one individual to act as an umpire or controller and eight players. Time estimates to train a controller
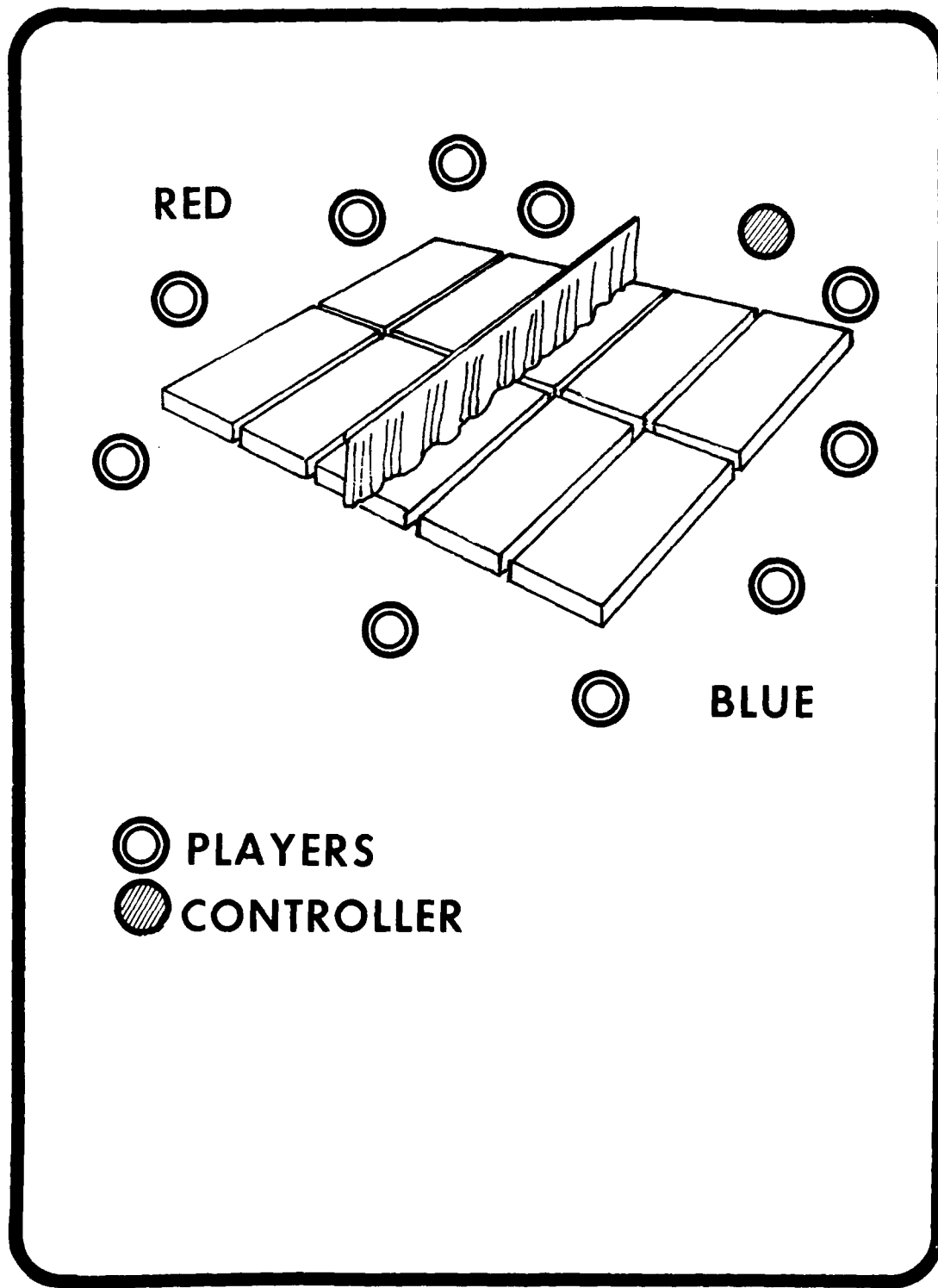
RED

BLUE

◎ PLAYERS
◉ CONTROLLER

Figure 1 Dunn-Kempf Physical Layout.

A2

range from two to several hours. Playing time for one complete game averages eight hours. The game is currently available to Army combat units.

The following is a summary of the major characteristics and components of Dunn-Kempf:

Physical Set Up. Dunn-Kempf is a multi-person game which is two sided. Opposing forces use the same three-dimensional game board, and view of opposing forces is obstructed by a screen or partition, except where line of sight detection occurs. The three-dimensional game board provides an accurate representation of the actual terrain. Planning is done using 1:50,000 maps. Fire plans are drawn up prior to commencement of game play.

Type of Forces. Opposing forces are represented by pieces which include the Table of Organization and Equipment (TO&E) capabilities for a combined arms company team and an OPFOR tank battalion. Major weapons systems are treated on an individual basis. Infantry weapons, except the RPG and LAW are treated as an aggregate and given a hit probability against various targets in that manner.

Non-Organic Fire Support. Game rules provide for play of 81mm mortar, 4.2 mortar, 155mm and 8-inch artillery support. Except for smoke, the game does not allow for the use of different fuze types or other artillery capabilities such as scatterable mine fields. Employment of attack helicopters and tactical air support play is a game option. Various ordnances used by these aircraft in support of ground operations are incorporated into the game rules.

Other Weapons and Equipment. Dunn-Kempf rules allow for play of mines and man-made obstacles. Electronic manning is another option which can be incorporated into game play.

Movement and Detection Rules. Movement for vehicles and infantry for each game time are equated to 30 seconds of actual combat. Movement distances are specified by type of terrain and methodology movement (e.g., vehicular or foot). Movement is also restricted if a particular unit or weapons system is receiving suppressive indirect or direct fire. Movement is also limited by natural or man-made obstacles and mine fields. Detection is of two types: 1) certain types of targets (tanks in defilade, troops in fortified positions) are detectable within a certain distance, and 2) if a weapon system fires, a cotton ball is placed on the board to represent the weapon signature. If line of sight determination shows the cotton ball visible, then detection is acquired.

Engagement Rules. Rules for engagement are provided for both
direct and indirect fire. Attack helicopters and close air sup-
port are considered direct fire engagement. A casualty
assessment probability table is used to decide all direct fire
engagements. Probability of a weapon getting a hit depends upon
such factors as type of target, distance to target, whether
target is stationary or moving, and type of cover. Kill proba-
bilities are also built into the table and are a function of the
weapons lethality, type of round being fired and type of target.
Helicopter and close air support is played somewhat differently.
Before aircraft can deliver their fires, the effect of air
defense is played to determine whether the mission can be
delivered. If the mission can be delivered, then accuracy
probability of the mission is played before probability of
a hit or casualty effects can be considered. Indirect fire
rules are also structured around the application of probability.
Die rolls are used to determine approval/non-approval of indirect
fire support from non-organic indirect fire (4.2 inch mortar,
105mm, 155mm, and 8 inch artillery). If approved, then probabi-
lity of error must be placed (except for final protective fires).
After this step probability of casualties from this indirect fire
is played.

Control Function. The controller in Dunn-Kempf is primarily an
administrator. He oversees game set-up and assists with the
game scenario. During game play he has the following specific
responsibilities: 1) monitors game play to assure compliance
with game rules, 2) verifies detection, 3) executes engagement
and suppression rules for direct and indirect fire, 4) receives
and processes indirect fire and close air support requests, and
5) impacts artillery and close air support missions. A video-
tape, guide book, and transcript are provided in the game
package for controller training. The time needed to train
controllers is generally stated as two to six hours.

Combined Arms Tactical Opposition Exercise (TOX) Multiple Players

The Tactical Opposition Exercise battle simulation game is de-
signed to provide the leaders of a company team (tank and mechanized
infantry platoons under the command of a tank company or mechanized
infantry company headquarters) with the opportunity to become familiar
with the nature of combined arms operations.

The training objectives of the game are:

● To increase the planning skills necessary to conduct both
defensive and attack combined arms operations.

● To provide an opportunity to practice small unit tactics.

- To develop leader awareness of extreme accuracy and lethality of modern weapons systems to include indirect fire.

- To develop leader experience in countering the effects of enemy employment of similar weapons.

- Proper utilization of terrain.

- To develop the ability to process information as a result of contact or observation of enemy forces and to formulate contingency plans which correctly anticipate or counter enemy actions.

The TOX game is played on either a three-dimensional or two-dimensional game board which represents terrain very similar to Northern or Central Germany (rolling terrain, some wooded areas, high speed approaches). The size of the area represented is three kilometers in width and ten kilometers in length.

Each player has his own game board and after initial planning, is partitioned from other team leaders. Figure 2 shows that and almost all contact between leaders is by radio. The only exception to this is where a team commander would request physical "on the ground" coordination with a particular element leader. If other team elements are visible to a particular leader, a controller will place appropriate pieces on his game board to represent the visual contact of the two elements.

Game players for the company team assigned an assault or movement to contact role are the team commander and forward observer, mechanized infantry platoon leader, and tank platoon leader. The team assuming the defensive position would be an infantry or armor platoon leader and a TOW section leader.

Game play in TOX is accomplished by opposing force players attempting to execute assigned missions through simultaneous movement of game pieces. These game pieces represent vehicles, troop complements and weapons systems currently listed by TO&E. A controller, who can observe all boards, provides appropriate information to each player when the position of a player's pieces dictates that information or cues be received. For example, the controller might place a cue piece representing a tank on the TOW section leader's game board. Although two other tanks were also in the area, the controller would not reveal their location because he determined that the TOW section did not have visual contact with the other tanks at that time.
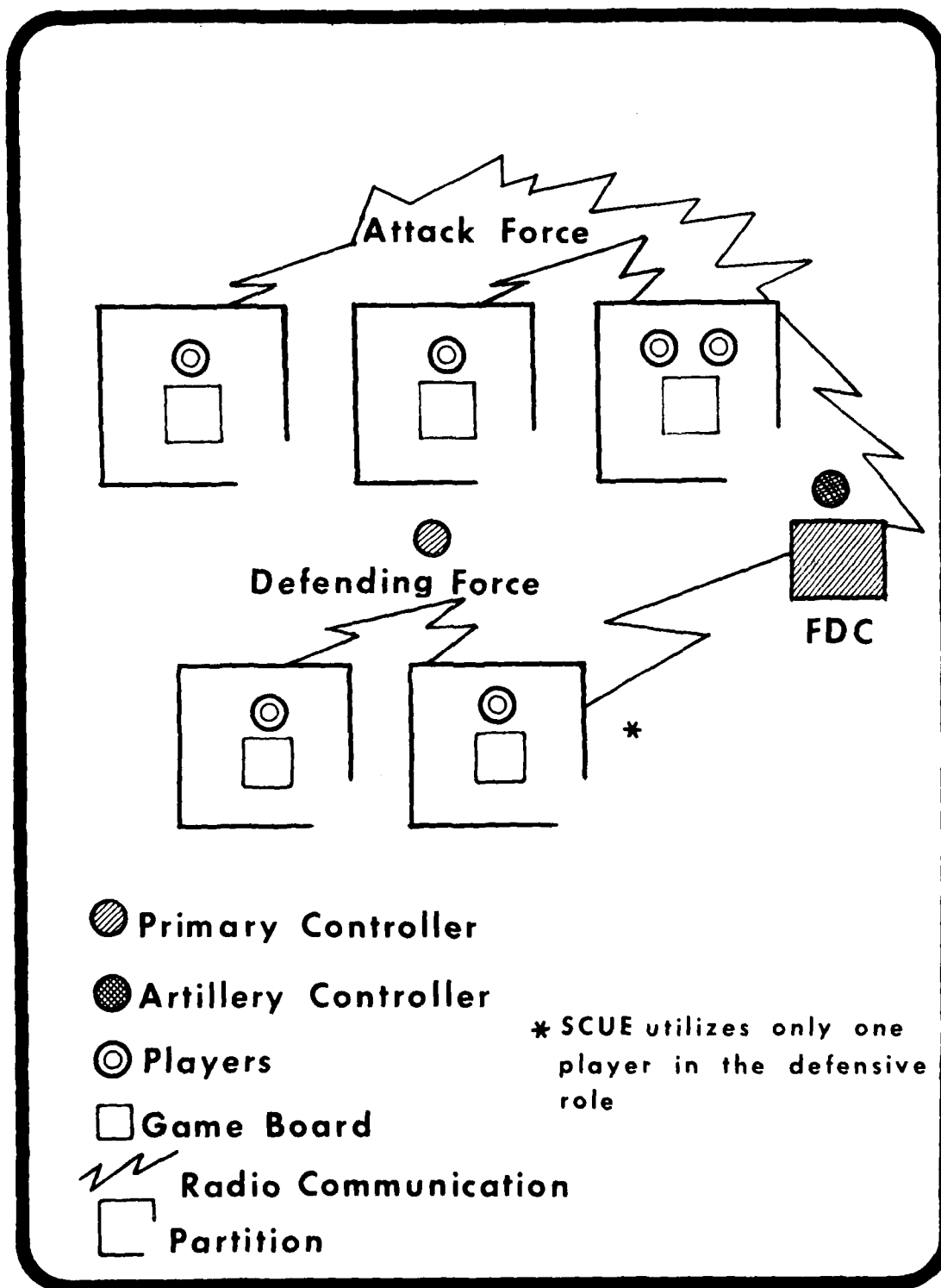
Figure 2   TOX and SCUE Physical Layout.

Once players have made their moves and received the necessary information they tell the controller what the actions of their elements are; that is, whether an element is going to engage, remain in place, or withdraw. If a weapons system or element is going to engage, the controller verifies range to target and consults a probability table to determine a hit. Players request indirect fire through another controller who simulates the FDC of a supporting artillery unit. Requests are made using a radio and proper request-for-fire procedures. This artillery controller also impacts missions on the player's game board and assesses casualties.

The amount of training and training materials needed for the direct fire controller and artillery controller have not yet been determined. Playing time for one game is approximately four hours. The game is currently in a research status and is not available to Army units.

The following is a summary of the major characteristics and components of TOX:

Physical Set Up. TOX is a multi-person game which is two sided. Opposing forces operate on separate game boards and cannot hear or see game participants on the opposing side. Element leaders for each side are also separated and must depend upon prior planning and radio communication to execute their mission. Each element leader also has his own game board. Two types of game boards have been developed: a three-dimensional rubberized surface to accurately simulate the terrain, and a two-dimensional surface with color coding to indicate differences in elevation. Like Dunn-Kempf, TOX utilizes 1:50,000 topographical maps for planning and conduct of the tactical operations.

Type of Forces. Opposing forces are represented by pieces which reflect current TO&E capabilities of U. S. mechanized infantry and armor units. Major weapons systems and small arms (machine guns, M203, rifles) are all treated on an individual basis.

Non-Organic Fire Support. Game rules provide for play of 4.2 mortar, 105mm and 155mm artillery support. The game allows for the employment of a number of different fuze types (PD, VT, DE) and smoke. Attack helicopter and air support employment are not incorporated into game play.

Other Weapons and Equipment. TOX game rules allow for play of both anti-personnel and anti-tank mines.

Movement and Detection Rules. Movement distances for vehicles are based on vehicle capabilities for one minute of travel. Vehicle capabilities are a function of type of vehicle, type

of terrain, and speed at which the vehicle is traveling. Dismounted infantry movement is specified by type of terrain and method of movement (crawling, running). Movement can also be restricted by suppression resulting from indirect fire. Detection consists of visual and aural detection. Both are a function of the rate of travel, numbers and types of vehicles, and type of terrain. For dismounted infantry rate of travel, terrain, and size of force are considered.

Engagement Rules. Rules for engagement are provided for direct and indirect fire. A casualty assessment probability table is used to decide all direct fire engagements. The probability of a weapon getting a hit depends upon: type of target, distance to the target, whether the target is stationary or moving, type of cover, and number of rounds or weapons being fired at the same target. Kill probability is a function of the type of weapon being fired. The indirect fire casualty assessment table enables the controller to determine the percentage of casualties or vehicles disabled for various types of indirect fire. Figures are computed according to troop or vehicle location in the sheaf, type of cover, fuze type, and number of rounds fired.

Control Functions. Control responsibilities in TOX are assumed by two controllers: one controller is responsible for the overall administration of game play while the other is responsible for processing requests for indirect fire, simulating the impact of the indirect fire, and assessing indirect fire casualties. The controller responsible for game play has these specific duties: monitors piece positioning and provides appropriate cues to players (cues are principally what elements see and hear), and executes engagement and assesses casualties. The exact training methods and materials needed to adequately train the primary controller and the artillery controller have not been determined.

Small Combat Unit Evaluation (SCUE)

This game was designed by the ARI Combat Performance Standards and Evaluation group to investigate the possibilities of forecasting engagement simulation outcomes. The game is played on an enlarged photo map of the training area on which the engagement simulation exercises are actually conducted. Currently game play is focused on a company team conducting a movement to contact mission against an anti-armor OPFOR of platoon minus strength.

SCUE basically utilizes the same physical set up as TOX. One primary difference is that the OPFOR is represented by one player who executes a set of actions based on a preplanned scenario. This is done to provide each company team with similar OPFOR actions and

thus maintains OPFOR actions as a relatively constant variable. The
scenario for the battle simulation game is based on the one developed
for the actual engagement simulation situation.

Game play in SCUE is also similar to that in TOX. Each game turn
includes a firing phase, a movement and detection phase, and an in-
direct fire phase. During game play all moves are made on numbered
hex sheets which are placed on top of the game board surface. Move-
ment, locations, points of contact, and indirect fire requests are
recorded by hex number to provide a data base. This data base is
the content for comparing unit activities in this battle simulation
game to those in the engagement simulation environment.

The game is currently being used in a research environment and
is not available to Army units.

The following is a summary of the major characteristics and
components of SCUE.

Physical Set Up. Game play is conducted on separate game boards.
As in TOX, element leaders must depend upon prior planning and
radio communication to execute their mission.

Type of Forces. The game currently focuses on a company team
size unit against a platoon minus force with anti-tank capa-
bility. All the major weapons systems are incorporated into game
play. However, the extent to which light and heavy machine guns
are played is not clear; M16s are not included in the casualty
effects table, and M203s are not played.

Non-Organic Fire Support. Artillery is played but no differentia-
tion is made between 105mm and 155mm. Heavy mortar support (4.2)
is also played. The game does not incorporate the various types
of fuzes available to ground combat units for use against the
different types of targets. Multiples of batteries are also not
incorporated into game play.

Other Weapons and Equipment. Currently employment of anti-
tank mines is not part of game play. However, the game's
weapons effects rules do include anti-tank mines.

Movement and Detection Rules. Movement rates are stated in hexes
per minute. Rates are dependent upon type of terrain and whether
movement is by vehicle or dismounted infantry. No distinction is
made between tanks and armored personnel carriers. Vehicle move-
ment is restricted by certain terrain features and by inclement
weather. No mention is made of movement restriction resulting
from indirect fire. Detection consists of visual and aural
detection. As in TOX, both are a function of rate of travel,
number of vehicles or infantry, and type of terrain. A number of

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special detection rules are provided which require certain
modifications to the above rules. For example, any type of
motion by a possible detecting unit decreases the detection
distance by one-half.

Engagement Rules. Rules for engagement are provided for both
direct and indirect fire. SCUE and TOX use the same hit
probability table for direct fire. SCUE, using REALTRAIN rules,
does not use probabilities to assess indirect fire casualties.
The direct fire weapons effects table for SCUE employs REALTRAIN
rules.

Control Function. Controller responsibilities in SCUE are the
same as those for TOX.

BOARD GAME RATING SCALE	LOW			MODERATE			HIGH		
	0	1	2	3	4	5	6	7	8
	NOT AT ALL	VERY LOW	LOW	LESS THAN MODERATE	MODERATE	MORE THAN MODERATE	SOMEWHAT HIGH	HIGH	VERY HIGH
MANAGEMENT: Planning									
Verbalizes objective in terms of:									
What is supposed to be done.									
Where it is to be done.									
At what time it is to be done.									
Verbalizes enemy situation in terms of:									
How many.									
Where.									
Anticipated action.									
Recent enemy activity.									
Equipment and weapons.									
Verbalizes friendly situation in terms of:									
Support (artillery, TAC air, gunship)									
Disposition of friendly forces.									
Verbalizes concept of operation in terms of:									
LD/LC									
Boundaries									
When phases of operation, if any, have been met.									
Check points and phase lines, if any									
Organize element operation									
Verbalizes execution in terms of:									
What participating elements will be doing.									
How security of movement will be maintained.									
Specific requirements for these elements and priorities.									
Actions to be taken in event of enemy contact									
Specific measures for controlling participating elements (phase lines, check points, rally points, attack positions).									
Adjustment of initial plan in event of heavy casualties.									
Verbalizes command and signal in terms of:									
Radio frequencies and call signs.									
Chain of command									
Other signals.									

	LOW			MODERATE			HIGH		
	0 NOT AT ALL	1 VERY LOW	2 LOW	3 LESS THAN MODERATE	4 MODERATE	5 MORE THAN MODERATE	6 SOMEWHAT HIGH	7 HIGH	8 VERY HIGH
MANAGEMENT: Planning									
Ask subordinates to read back specific responsibilities.									
Graphically display overall operation using visual aids (ground, sticks, rocks).									
Ask subordinates to demonstrate, using visual aids, their specific tasks.									
Conducts abbreviated rehearsal of planned execution by deploying forces in mock exercise.									
MANAGEMENT: Execution and Control									
Maintains continual communication with all elements.									
Contacts subordinates who are not adhering to designated reporting procedures.									
Frequently asks for immediate and complete information from advance elements.									
Gives immediate direction and/or guidance in response to enemy activity (may first request additional information).									
Quickly identifies failures in execution of plan by participating elements and corrects them.									
Recognizes critical points at which contingency plans should be implemented.									
MANAGEMENT: Initiating Structure									
Provides detailed instructions to subordinates regarding subordinates' responsibilities and those of other elements.									
Breaks mission down into achievable steps									
Explains to subordinates exactly who will replace leaders who become casualties.									
Informs subordinates of deadlines (e.g., LD times, times objectives are to be secured).									
Describes well defined patterns of communication (e.g., SITREPs, "who talks to whom, when, about what, and how").									
Specifies clearly contingency plans including conditions under which contingency plans will be implemented (e.g., loss of communication).									

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	LOW			MODERATE			HIGH		
	0	1	2	3	4	5	6	7	8
	NOT AT ALL	VERY LOW	LOW	LESS THAN MODERATE	MODERATE	MORE THAN MODERATE	SOMEWHAT HIGH	HIGH	VERY HIGH
MANAGEMENT: Initiating Structure (Contd)									
Sets definite standards of performance for specific tasks and responsibilities (e.g., specific dimensions of prone positions).									
Explains rationale for planned actions.									
Makes periodic checks on progress of group with respect to assigned tasks.									
Enforces rules of conduct (e.g., informing subordinates of violations/consequences and taking appropriate disciplinary actions).									
Specific questions are posed by the leader to subordinates concerning their responsibilities and those of their peers (e.g., verbally responds to questions, uses maps, makes ground drawings, etc.).									
MANAGEMENT: Interaction with Subordinates and Supervisors									
Solicits reactions, opinions, suggestions of subordinates and superiors regarding mission.									
Responds to nonverbal cues, gestures of subordinates and superiors regarding their reactions to the plan.									
Provides public praise and recognition for work well done (decides appropriateness of public versus private praise).									
Listens attentively to unsolicited suggestions from subordinates.									
Delegates responsibility to subordinates.									
Allows subordinates to carry out delegated tasks (avoids encroaching on delegated responsibilities and avoids publicly criticizing subordinates).									
Recognizes strengths and weaknesses of subordinates and assigns tasks accordingly.									
Calmly and firmly interrupts arguments, disagreements and other conflicts among subordinates.									

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	LOW			MODERATE			HIGH		
	NOT AT ALL	VERY LOW	LOW	LESS THAN HALF	ABOUT HALF	MORE THAN HALF	HIGH		VERY HIGH

MANAGEMENT: Interaction with Subordinates and Superiors (Contd)

When confronted with a refusal to carry out an order:

Attempts to find out why subordinate is refusing.

Responds to objections by explaining rationale or providing additional support.

If subordinate continues to refuse, remove individual and identify replacement(s).

Specifically describes to subordinates how they will be backed up in tight situations.

Provides specific follow-up instructions in calm, assuring tone to subordinates who are in danger and obviously anxious.

Notices possible subordinate injuries and provides for appropriate treatment.

Tactfully and firmly provides corrective feedback to subordinates.

Firmly states unpopular decisions without apologizing (or blaming higher authority).

Defends/supports actions of subordinates when criticized by others.

Honestly admits mistakes to subordinates and superiors.

Tactfully disagrees with superior's plans and provides possible alternatives.

Sets positive examples for subordinates (e.g., noise discipline, staying awake, not smoking at night, camouflage, etc.).

Speaking with enthusiastic, confident tone.

Praising group instead of individuals, if appropriate.

Identifying importance of specific team elements in achieving group goals.

Provides specific positive praise for particular tasks well done.

Stays active by constantly interacting with subordinates (inquiring about progress of individual tasks/assignments).

	LOW			MODERATE			HIGH		
	0	1	2	3	4	5	6	7	8
	NOT AT ALL	VERY LOW	LOW	LESS THAN MODERATE	MODERATE	MORE THAN MODERATE	SOMEWHAT HIGH	HIGH	VERY HIGH
COMMUNICATION: Transfer of Information									
Asks subordinates for clarifying questions.									
Asks subordinate to "read back" their specific responsibilities in operation.									
Corrects any misunderstandings based on "read back."									
Answers clarifying questions directly.									
Identifies information consolidation points.									
Informs subordinates of what information is to be transmitted (SALUTE).									
Informs subordinates of non-verbal means of communication which could convey actions to be taken.									
Underscores critical points for emphasis.									
Prethinks communication.									
Speaks distinctly and slowly.									
Speaks with conviction.									
Maintains steady eye contact (when appropriate).									
Uses graphic aids.									
Gestures to convey meaning.									
Disseminates information at periodic intervals to subordinates and superiors.									
Informs subordinates of changes in planned action.									
After receiving communication, selects relevant information to transmit.									
After selecting relevant information, selects appropriate method of communication.									
COMMUNICATION: Pursuit and Receipt of Information									
Encourages suggestions non-verbally by standing with open posture, maintaining eye contact, nodding, avoiding frowning and grimacing.									
Summarizes and paraphrases key points without a commitment to implement or not to implement suggestion.									
Probes for more detail.									

	LOW			MODERATE			HIGH		
	0	1	2	3	4	5	6	7	8
	NOT AT ALL	VERY LOW	LOW	LESS THAN MODERATE	MODERATE	MORE THAN MODERATE	SOMEWHAT HIGH	HIGH	VERY HIGH

COMMUNICATION: Pursuit and Receipt of Information (Contd)

Determines what information is needed.
Who possesses it.
How to collect it.
Asks superiors questions on any information that is unclear and needs clarification.

The objective of the mission.
The enemy situation with respect to size of force, indirect fire capability, armor capability, current activity and anticipated actions.
Proposed execution of operation, including boundaries, starting point, location of objective, and appropriate times.
What artillery support will be available.
Necessary call signs and radio frequencies.

Sends out lead element.
Selects best personnel for task. (Skilled in map reading, moving quietly, acute vision.)
Means of communication is established (SITREP).

Given some distinct cue (e.g., explosion, small arms fire, etc.) attempts to identify specific nature of cue (by radio communication, runner, etc.).

After receiving incomplete verbal communication, obtains more complete information by verbally requesting information, sending fire team, using prearranged signals, etc.
If possible to obtain more information, develops plausible hypotheses as to nature of situation and makes decisions accordingly.

PROBLEM SOLVING: Identifying and Interpreting Cues

Recognizes cues as indicator of enemy actions, intentions, or presence. (Note: especially important to recognize low visibility cues such as paper, feces, noise, land line, etc.).
Forms tentative hypotheses as to enemy's disposition (size, location, and intentions) given current and previous cues.

	LOW			MODERATE			HIGH		
	0	1	2	3	4	5	6	7	9
	NOT AT ALL	VERY LOW	LOW	LESS THAN MODERATE	MODERATE	MORE THAN MODERATE	SOMEWHAT HIGH	HIGH	VERY HIGH
PROBLEM SOLVING: Weighing Alternatives									
Identifies alternative actions, given an interpretation of cues.									
Determines probable consequences of each alternative action.									
PROBLEM SOLVING: Chooses and Executes Course of Action									
Selects alternative action that leads to most favorable (contributes most to mission accomplishment) consequence. (Aspects to be considered include time, casualties, ammunition, weapons required.)									
Executes course of action.									
Obtains information regarding consequences of chosen course of action.									
Repeats problem solving cycle as necessary									
TACTICAL: Application									
Instructing subordinates to maintain noise and light discipline.									
Maintaining minimal radio traffic (radio discipline).									
Moving during inclement weather.									
Instructing subordinates to camouflage weapons, equipment, vehicles, positions, and themselves.									
Instructing subordinate leaders to use routes of movement (and method of movement) to minimize exposure.									
Instructing subordinates in methods for exercising caution when moving.									
Includes several OPs, LPs, patrols and ambushes as far forward as possible to provide adequate early warning and maximum number of engagement opportunities.									
Includes an advance element (or RECON when moving) as far forward as possible.									
Disperses overwatch elements to maximize observation and engagement opportunities.									
Booby traps, mines, probable avenues of approach.									

	LOW			MODERATE			HIGH		
	0	1	2	3	4	5	6	7	8
	NOT AT ALL	VERY LOW	LOW	LESS THAN MODERATE	MODERATE	MORE THAN MODERATE	SOMEWHAT HIGH	HIGH	VERY HIGH

TACTICAL: Application (Contd)

Identify enemy's weakest point by employing probing action.

Engage attacking force as many times as possible before becoming decisively engaged.

Engages enemy at unexpected times and places (e.g., attacking enemy's rear).

Maintains reserves to meet unforeseen disposition of enemy.

TECHNICAL-EQUIPMENT: Vehicles

Operational check of vehicles prior to mission.

Instructs subordinate leaders on specific methods of movement (e.g., follows folds of terrain, overwatch, smoke).

Checks to ensure vehicles are properly camouflaged.

TECHNICAL-EQUIPMENT: Communication Equipment

Inspects communication equipment prior to initiating mission.

Uses all available means of communication.

Assigns communication equipment to most secure locations (e.g., center as opposed to periphery of mass).

Instructs subordinates on how to maintain proper communication security (e.g., Upholds/Enforces SOI).

Instructs subordinates on how to safeguard commo equipment (e.g., conceal land-mine).

Develops alternative communication plans and informs subordinates of those plans.

Obtains required frequencies (primary and alternate) and informs all personnel.

TECHNICAL-BASIC: Terrain Analysis

Identifies probable enemy positions depending on topography.

Accurately identifies possible enemy avenues of advance.

Uses terrain to conceal routes of advance.

	LOW			MODERATE			HIGH		
	0	1	2	3	4	5	6	7	8
	NOT AT ALL	VERY LOW	LOW	LESS THAN MODERATE	MODERATE	MORE THAN MODERATE	SOMEWHAT HIGH	HIGH	VERY HIGH

TECHNICAL-BASIC: Map Reading

Item	0	1	2	3	4	5	6	7	8
Accurately follows planned avenues of advance.									
Contains all action (movement and fire) within specified boundaries.									
Accurately identifies coordinates of enemy positions.									
Occupies correct positions as identified on map.									

TECHINCAL-EQUIPMENT: Weapons

Item	0	1	2	3	4	5	6	7	8
Inspects weapons prior to initiating mission.									
Places weapons so that they take best advantage of maximum effective range.									
Positions weapons where they are most likely to engage appropriate targets (e.g., matches targets to weapons).									
Positions weapons to have overlapping fields of fire.									
Positions weapons to compensate for limitations of other weapons (e.g., putting anti-tank mines on a probable avenue of approach that can't be covered by deployed primary weapon).									
Uses appropriate fuzes and amounts (VT on troops in the open, DE on armored vehicles, PD on reinforced positions).									
Uses pre-planned fires on anticipated enemy locations.									
Uses registration points to ensure security and to ensure artillery requests.									
Requests marking rounds prior to FFEs to ensure proper placement and maximum effective use of artillery.									

INSTRUCTIONS FOR RATERS

The following is a rating scale for assessing two dimensions of battle simulation games: 1) the degree to which the game provides an opportunity for exercising leader skills that are found in combat and ES situations, and 2) the degree to which the game achieves fidelity, i.e., approximates the performance demands of real combat or ES situations.

In order to rate the opportunity dimension, we are asking you to go through a two-step process. First, look over the skill in question and decide which of the three broad categories (LOW - MODERATE - HIGH) describes the degree to which the game provides players an opportunity to perform, and therefore practice, the skill in question. Secondly, you are asked to make a finer discrimination; within the broad category you have chosen, select the phrase that best describes the opportunity to practice the skill provided by the game. When you have made your decision, place an "X" in the appropriate column.

Follow the same general process in rating, for each skill, the degree to which the game requires the same behavior, or performance, as real combat or engagement simulation (SCOPES, REALTRAIN, MILES) exercises. We would like to find out the degree to which you feel this game requires players to perform the same actions and make the same decisions as combat or engagement simulation exercises. For this rating, first decide which of the three broad categories (LOW - MODERATE - HIGH) describes the degree to which the game approximates real combat or engagement simulation exercises for the skill in question. Next, within the broad category you have chosen, select the phrase that best describes this approximation. When you have made your decision, place an "O" in the appropriate column.

Following is an example of what we are asking you to do:

a.   The figure below lists two hypothetical skills in the area of technical equipment. The first skill reads "Engage the enemy at maximum effective tank range." To what degree does the game permit a player to engage the enemy at maximum effective tank range?

b.   In our hypothetical game, let's assume that the terrain board, OPFOR play, and tank play provide the opportunity to engage the enemy at maximum range. However, the combat results table plays a probability of hit of .9 at 4,000 meters range. We might rate the

opportunity to engage at maximum range as <u>high</u> and place an "X" in column 7. On the other hand, we may feel that the fidelity of a probability of hit or .9 at that range is low and place an "O" in column 2.

      c.   In the hypothetical game, we may next look at the capability to "Employ the M203 to produce maximum enemy casualties." The game may have an excellent combat results table with a good simulation of weapons effects, while the game player must respond alone during a single game turn to several inputs simultaneously. *In responding in this fashion* we may find only a few occasions allowing M203 employment. Under these circumstances we might rate the opportunity to employ the M203 as "Low" by placing an "X" in column 2, and the fidelity as "High" by placing an "O" in column 7.

	LOW			MODERATE			HIGH		
	0	1	2	3	4	5	6	7	8
	Not at All	Very Low	Low	Less than Moderate	Moderate	More than Moderate	Somewhat High	High	Very High
TECHNICAL EQUIPMENT: Weapons									
Engage the enemy at maximum effective tank range.			0					X	
Employ the M203 to produce maximum enemy casualties.			X					0	

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APPENDIX D

TABLE 8A

MEAN RATINGS BY SKILL CATEGORY

SKILL CATEGORY	OPPORTUNITY									FIDELITY								
	TOX			Dunn-Kempf			SCUE			TOX			Dunn-Kempf			SCUE		
	1st Rating	Re-Rating	Diff	1st Rating	Re-Rating	Diff	1st Rating	Re-Rating	Diff	1st Rating	Re-Rating	Diff	1st Rating	Re-Rating	Diff	1st Rating	Re-Rating	Diff
Management																		
Planning	6.5	5.4	1.1	5.2	5.2	.0	5.8	5.4	.4	5.1	4.8	.3	4.1	3.9	.2	4.5	4.3	.2
Execution & Control	6.8	6.4	.4	5.0	5.1	.1	5.8	6.6	.8	5.0	5.3	.3	1.5	1.8	.3	5.5	4.9	.6
Initiating Structure	6.0	4.4	1.6	3.9	4.0	.1	5.0	4.9	.1	4.5	3.5	1.0	2.6	2.4	.2	3.3	3.6	.3
Interaction with Sub-ordinates/Supervisors	4.9	4.1	.8	4.3	4.6	.3	4.8	4.5	.3	3.7	3.6	.1	2.9	2.7	.2	3.7	3.4	.3
Communication																		
Transfer of Information	6.4	6.1	.3	4.5	4.1	.4	5.9	5.8	.1	5.4	5.3	.1	3.0	2.1	.9	4.9	4.8	.1
Pursuit & Receipt of Information	6.3	5.8	.5	5.1	5.5	.4	5.5	5.7	.2	5.2	4.7	.5	3.3	2.9	.4	4.4	4.0	.4
Problem Solving																		
Identifying & Interpreting Cues	6.5	7.0	.5	3.9	5.7	1.8	5.9	6.4	.5	5.4	6.0	.6	2.7	2.8	.1	4.3	4.5	.2
Weighing Alternatives	7.3	7.0	.3	4.4	4.3	.1	6.5	7.0	.5	6.1	6.3	.2	3.1	1.9	1.2	5.5	5.4	.1
Chooses & Executes Course of Action	7.5	7.0	.5	5.6	5.3	.3	6.1	6.4	.3	6.3	6.3	.0	3.6	2.4	1.2	4.7	4.6	.1
Tactical																		
Application	6.1	5.8	.3	4.6	4.6	.0	5.8	5.5	.3	5.8	4.1	1.7	3.2	2.7	.5	4.1	3.9	.2
Technical																		
Equipment	4.9	3.8	1.1	2.8	2.4	.4	3.8	3.2	.6	3.3	2.9	.4	2.2	1.6	.6	2.8	2.3	.5
Basic	6.9	7.0	.1	6.0	7.0	1.0	6.3	6.3	.0	5.7	5.4	.3	4.9	5.5	.6	4.9	4.3	.6

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TABLE 9A

MEAN RANGES BY SKILL CATEGORY

| | | OPPORTUNITY | | | | | | | | | FIDELITY | | | | | | | | |
| | | TOX | | | Dunn-Kempf | | | SCUE | | | TOX | | | Dunn-Kempf | | | SCUE | | |
SKILL CATEGORY		1st Rating	Re-Rating	Diff	1st Rating	Re-Rating	Diff	1st Rating	Re-Rating	Diff	1st Rating	Re-Rating	Diff	1st Rating	Re-Rating	Diff	1st Rating	Re-Rating	Diff
Planning	Management	2.9	.9	2.0	3.1	1.8	1.3	2.4	1.5	.9	4.6	1.2	3.4	3.5	1.7	1.8	2.6	1.4	1.2
Execution & Control		2.2	.8	1.4	5.1	3.2	1.9	2.2	.6	1.6	4.0	1.8	2.2	3.5	2.0	1.5	1.8	1.2	.6
Initiating Structure		4.0	1.0	3.0	3.3	1.8	1.5	2.9	1.4	1.5	4.5	1.3	3.2	3.1	1.7	1.4	2.7	1.3	1.4
Interaction with Sub-ordinates/Supervisors		5.7	1.5	4.2	4.4	1.9	2.5	3.4	2.1	1.3	4.5	1.4	3.1	4.1	2.4	1.7	2.8	1.9	.9
Transfer of Information	Communication	2.6	.5	2.1	4.9	1.8	3.1	2.0	1.3	.7	4.8	1.3	3.5	3.6	1.3	2.3	2.2	1.4	.8
Pursuit & Receipt of Information		2.1	1.0	1.1	4.3	1.7	2.6	2.4	1.5	.9	4.1	1.6	2.5	4.1	1.6	2.5	2.7	1.6	1.1
Identifying & Inter-preting Cues	Problem Solving	3.0	.0	3.0	6.0	1.5	4.5	3.0	2.0	1.0	4.5	2.0	2.5	7.0	1.0	6.0	3.0	2.0	1.0
Weighing Alternatives		1.0	.0	1.0	6.0	1.0	5.0	1.0	.0	1.0	4.0	1.0	3.0	7.0	.5	6.5	1.0	1.0	.0
Chooses & Executes Course of Action		1.3	.0	1.3	5.6	1.8	3.8	.5	1.5	1.0	4.5	1.0	3.5	6.5	2.8	3.7	1.8	1.3	.5
Application	Tac-tical	2.3	1.3	1.0	3.7	1.0	2.7	1.9	1.0	.9	4.1	1.0	3.1	3.3	1.4	1.9	2.1	1.5	.6
Equipment	Tech-nical	4.2	.8	3.4	2.4	.7	1.7	3.5	1.4	2.1	3.7	1.1	2.6	2.8	1.0	1.8	3.3	1.7	1.6
Basic		1.3	.0	1.3	4.1	.7	3.4	1.4	1.3	.1	4.4	.9	3.5	4.3	1.4	2.9	2.4	1.6	.8